Recessions in Higher Education:
A Study of Faculty Sensitivities to Changes in Funding Vis-à-vis Periods of Recession

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March 16th, 2020

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Abstract

This paper analyzes the degree to which faculty at public universities are further impacted by the financial difficulties brought about by recessions than their private counterpart and how that trend has changed over time. Contracting state budgets for public universities and dips in endowment revenue for private universities compel these institutions to cut back on large-scale spending, such as faculty, or garner the missing revenue from other sources, such as raising the cost of tuition. We consider the number of faculty and their respective salaries as our outcomes of interest. We hypothesized that public universities would fare worse during economic downturns than private universities primarily due to specific vulnerabilities in their funding relative to private universities. Using university-level fixed effects, we consider university faculty disaggregated by rank, sex, and salary. This study contributes to some existing literature on recessions and their relationship to universities specifically by addressing the aspects relating to faculty counts and earnings, and covering more recessions. It considers historical data from 1983 to 2014, capturing the four previous recessions. We find that while in some instances, faculty at public higher education institutions are more vulnerable to the adverse effects of a recession, it is not always the case.

I. Introduction

Higher education institutions are not islands. Universities are vulnerable to the hardships engendered by recessions. During these times, when the primary mechanism that operates universities—funding—experiences unstable oscillations, the financial security of these institutions, and those who operate in their domain, becomes jeopardized. The largest category for which public and private nonprofit higher education institutions direct their expenditures is instruction, specifically comprising faculty salaries and benefits (Li et al., 2019). Currently, the

historical impact of recessions on universities remains almost completely unquantified, to the best of our knowledge.

Using data on faculty composition, macro-economic recession indicators, and university-level funding, the question this paper aims to answer is as follows: "to what degree are faculty at private institutions better insulated during periods surrounding a recession than their private counterpart?" Rigid wage theory predicts that due to downward-inflexibility of wages, we would expect higher education institutions to, at the very least, stop hiring, but perhaps experience decreases in the number of faculty members. The lack of downward mobility for wages does not preclude the possibility, however, that wage growth could stagnate relative to prior levels, or entirely. In fact, we demonstrate that wages are persistently vulnerable. We expected public universities to fare worse during recession than private universities primarily due to how respective funding to these schools responds to inauspicious market conditions. Analyzing the primary external funding to public and private universities respectively, state appropriations are more severely impacted from recessions than endowments (Cheslock and Callie, 2015).

To accomplish this task, we use university-level fixed effects to analyze arguably the two most important indicators of faculty prosperity disaggregated by rank and sex across years: number of faculty employed rank, and salary. We employ fixed effects to allow for heterogeneity across different universities and avoid incumbent omitted variable bias within universities. We do so to account for the possibility that some universities may have latent and time-invariant characteristics that make them more, or less, vulnerable to exogenous market conditions than other universities. To name a few of these possible characteristics, we could imagine that rank, esteem, or even natural endowments of a university would all be relatively stable money makers, thereby reducing their reliance on external state or personal aid. Accordingly, we would like to

limit the influence of these factors on our analysis, and attempt to do so through within-university controls.

The abstract hypothesis of this paper is intuitive, the more university funding fluctuates and the larger the macro effects of the recession, the larger the impact we expect on faculty. The impact of a recession on a university can be long-lasting. As was the case for the most recent 2008 recession, state funding to universities does not return to its pre-recession levels (Mitchell et al., 2018). As a result, public universities are forced to rely more heavily on their tuition dollars, at least in the long run (Mitchell et al., 2018). In the short run, when aggregate incomes in the U.S. experience little growth and general variation, raising tuition can be inadvisable. For this reason, universities are required to cope with the recession-induced financial difficulties in other manners, namely by pursuing changes in the two key variables mentioned above, number of faculty and salary. These specific fluctuations are primary levers in the public higher education arena—which reinforces the next component of the hypothesis, namely that these persistent repercussions for universities are going to induce a larger share of the recessional-burden falling on the public institutions rather than their private counterparts. As is demonstrated in the results, this is not, however, always the case.

II. Previous Literature

While the literature circulating in this arena is sparse, there have been a few notable contributions to the field in terms of faculty and recessions. The work of Cheslock and Callie (2015) looked at how business faculty composition and salary were affected by financial difficulties from 1999 to 2006, at public universities. Their dataset came from the Association to Advance Collegiate Schools of Business (AACSB), a survey that provided them with faculty-level salary for all full-time faculty at colleges across years, allowing them to discern changes of

faculty salary and composition. This paper draws attention to the fact that public universities may have a difficult time staying competitive with private universities when relative funding declines. The authors point out that these public universities facing financial difficulties are faced with a dilemma since, for universities, cutting back on faculty to cut costs could lead to decreases in the revenue-garnering production from these faculty members, i.e. research and teaching. They also describe a specific facet of the long-run and short-run difficulty these institutions face. Namely, that, in the short run, adjusting faculty compensation and composition are difficult to implement due to the nature of tenure. Additionally, their methodology provides precedent for our empirical strategies. For changes in salary they estimate difference and fixed-effects regressions to examine how responsive salary was to changes in state appropriations. In a similar vein, for salary distribution they look at the Theil index and variance of log salary. They used a similar methodology for estimating the effects on faculty size. Their results align with intuition: when state funding increases, both business faculty salary and business faculty size also increase. What their study fails to answer however is whether this result is robust across departments, in particular, are non-business related fields less insulated? This study aims to augment this existing study by expanding the parameters and years of analysis. That is to say, this paper is tasked with looking at faculty across departments, not just business, at both public and private institutions as well as covering a larger time period, 1983-2014.

The work of Delaney and Doyle (2011) delineates the intricacies of university funding and provides legitimacy to this research question. Considering, what they call "The Balance Wheel Model" they consider year-to-year differences in spending for higher education institutions in relation to state spending in other categories. Their first finding is that, as they say, in "good years," characterized by positive changes in state spending, the spending allotted to higher

education institutions will increase more rapidly than spending in other state budget categories. They describe this mathematically as the function being concave up when changes in state spending are positive. Conversely, when states are in "bad budget years," characterized by negative changes in state spending, the spending allotted to higher education institutions will decrease more rapidly than spending in other state budget categories. Once again, they express this mathematically as the function being, in this case, concave down when changes in state spending are negative. Thus, it is reasonable to suspect that so-called "bad years" contribute to the legitimacy of supposing that public universities are especially at risk. In addition, this study points out that trends for appropriations are not uniform across states—in some states, universities fare much worse than in others to these fluctuations. Allowing for heterogeneity across universities with the fixed effects model should ameliorate, to some degree, these differences in funding between states. Lastly, this paper helps lead to the conclusion that the primary and traditional stimulus that manipulates faculty composition and compensation at higher education institutions, funding, favored private higher education institutions over their public counterpart— in other words, endowments fared better than state appropriations (Cheslock and Callie, 2015), further suggesting that public universities could be more at stake than private.

The work of Zhang and Liu (2010) find that share of part-time faculty, as a component of total faculty, has been increasing since the 1990s while the share of full-time instructors and lecturers has been fairly stable. They also found important institutional differences: public higher education institutions, for example, are more likely to hire full-time non-tenured track faculty whereas private institutions are more likely to hire part-time faculty. Additionally, they find that Doctoral/Research Institutions I and Liberal Arts Colleges I are less likely to hire part-time

faculty and more likely to hire full-time non-tenure track faculty. Moreover, they find a positive relationship between the magnitude of revenue a university accumulates and the number of full-time faculty, as well as a negative relationship between the level of revenue and the number of part-time faculty. While our study does not observe part-time faculty, each of these university characteristics regarding tenure-track and non-tenure track faculty are important faculty-sensitive considerations with regards to how universities manage their costs.

A recent study, Bound et. Al (2020), looked at the specific means by which universities cope with sharp declines in funding during recessions. The conclude that when state-appropriations to U.S. universities decline, these institutions are face with options for cutting costs or increasing revenues: raise tuition fees, cut expenditures, or increase the proportion of foreign enrollment and general out-of-state students. Our study is primary concerned with the second option—cutting costs, specifically costs related to faculty. Their primary finding was that given contractions in state budgets, public universities have increased the proportions of international students to offset the lack of revenue provided from the state. They find that a 10% reduction in state appropriations leads to an increase of 12% from foreign enrollment at public research universities, and 17% at the most "resource-intensive" public universities. They conclude that had students from abroad abstained from enrollment in U.S. higher education institutions, many universities would have had been confronted with raising in-state tuition levels, and even large-scale cuts in expenditures. Much of this increased proportion of foreign enrollment, they argue, is driven by the increase in the supply of foreign students that are seeking education in the U.S., and are financial prepared to pay for it, most notably from China and India.

III. Data

The data necessary for this paper was accumulated from a variety of sources. From the American Association of University Professors' (AAUP) Annual Report on the Economic Status of the Profession, we obtained university-level data on full-time faculty composition and compensation disaggregated by rank and sex, over the period from 1978 to 2014. More specifically, this data set indicates, for each of the top 50 universities[1] in each year between 1978 and 2014, the number of full, associate, or assistant professors and instructors, and each of their respective salaries[2], disaggregated by whether they are male or female. To look within universities across time, we required observations from the same institution over multiple years. To the best of our knowledge, the AAUP is the only survey for which these requirements were fulfilled.

Universities are typically funded through a variety of sources; while much of it is sourced from the university itself, through tuition and other fees, considerable portions of public university revenue are also garnered from federal, state, and local governments in the form of research grants, general-purpose appropriations, and research-specific appropriations (PEW, 2019). Over the last few decades, it has been well documented that state appropriations are gradually declining while tuition levels have risen to compensate (Mitchell et al., 2018). Accordingly, a crucial component of data for this paper was general, university-level state appropriations per fiscal year (FY).[3] This data was used as one of the primary independent variable to describe the impact on faculty at public universities, as well as a robustness check for simple recession indicator measures. Whereas public universities gather funding from a diverse

[1] The method used for obtaining this ranking was to take the top 25 respective public and private universities from the *U.S. News & World Report* 2018.
[2] Salaries were deflated to 1983 dollars.
[3] State appropriation data and trends from 1978-2008 were obtained from *Appropriations of State Tax Funds for Operating Expenses of Higher Education* and are deflated to 1983 dollars.

group of sources, private universities rely almost entirely on tuition, endowments, and donations. To adequately describe these fluctuations for private universities however, this paper is only concerned with the type of traditional funding that motivates their fluctuations in faculty composition and compensation—endowments. The endowment data, deflated to 1983 dollars, spans the years from 1990-2015. [4]

The last necessary components of data come from Federal Reserve Economic Data (FRED). From this database, we obtained macro-economic indicators, namely: the unemployment rate, the duration of each recession, and the years in which the recession occurs. These will each be used primarily as controls in our empirical work to follow. The most important of these indicators will certainly be the unemployment rate, which will serve as a proxy to the magnitude of a recession.

In the tables displayed on the next page we see some of the descriptive statistics relating to the faculty data from the AAUP surveys previously mentioned. In *Summary Table 1*, we can see the mean values for the number of professors at each rank that in the years 1984, 1994, 2004, 2014, disaggregated by sex. These years were chosen to establish points of reference for growth over time. Similarly, in *Summary Table 2* are displayed the means associated with the salaries in 1984, 1994, 2004 and 2014, also disaggregated by rank and sex. The data in *Summary Table 1* illustrates that between 1984 and 2014, at public universities, the average number of professors at multiple ranks decreased among men, and increased dramatically among women. Among private universities in this time, both the average number of male faculty and female faculty increased substantially, presumably to match the increased demand for higher education. In addition, looking at the salary data from *Summary Table 2*, while we can observe nearly-

[4] Endowment data was obtained from the NACUBO Common fund Study of Endowments

Summary Table 1: Full-Time Faculty Count, 1983 dollars, by Public and Private Universities 1984-2014

	1984		1994		2004		2014	
	Private	Public	Private	Public	Private	Public	Private	Public
Full-Professor Male	288.2	541.8	323.4	544.4	363.6	550.2	376.5	518.5
	(126.4)	(230.0)	(137.8)	(209.9)	(145.4)	(180.3)	(162.3)	(160.2)
Associate Professor Male	126.2	310.5	116.2	299.8	123.3	267.9	129.7	241.1
	(69.46)	(121.8)	(60.82)	(123.5)	(67.78)	(93.60)	(71.33)	(97.65)
Assistant Professor Male	139.1	222.8	109.3	181.5	121.1	209.2	111.3	178.0
	(177.0)	(98.77)	(37.38)	(73.49)	(44.61)	(71.85)	(43.31)	(63.43)
Instructor Male	11.74	21.32	9.812	20.24	14.33	16.06	8.042	10.88
	(8.297)	(20.84)	(6.369)	(20.70)	(15.10)	(19.94)	(16.88)	(23.46)
Full-Professor Female	18.09	40.05	45.81	71.71	78.13	123.4	118.6	172.2
	(16.64)	(19.78)	(23.93)	(32.46)	(43.94)	(43.92)	(57.52)	(60.53)
Associate Professor Female	31.74	72.58	41.56	102.1	60.73	143.2	81	164.0
	(24.08)	(29.25)	(25.61)	(38.93)	(42.11)	(44.80)	(49.95)	(63.81)
Assistant Professor Female	44.52	92.42	62.44	124.8	74.13	149.1	73.58	152.6
	(26.74)	(36.11)	(26.23)	(51.17)	(31.61)	(45.41)	(33.72)	(69.81)
Instructor Female	9.304	26.32	10.50	26.06	17.33	21.82	6.250	13.62
	(11.42)	(24.67)	(11.59)	(24.74)	(22.27)	(28.63)	(16.99)	(27.28)
Observations	42		33		32		48	

Means displayed; sd in parentheses

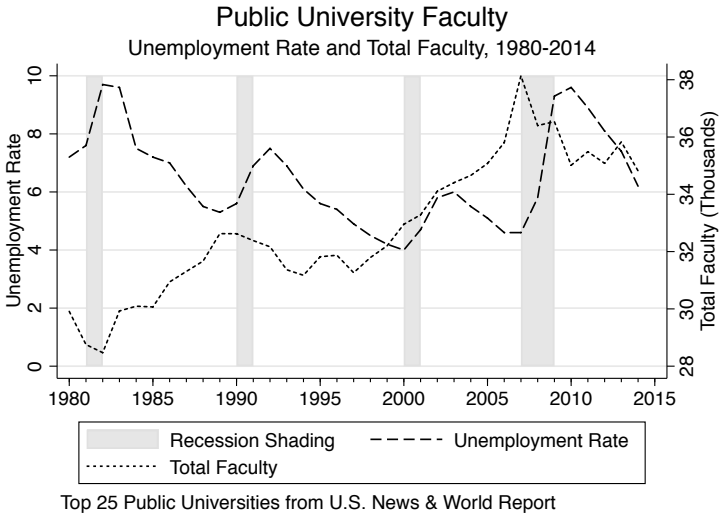
Summary Table 2: Full-Time Faculty Salary, 1983 dollars, by Public and Private Universities 1984-2014

	1984		1994		2004		2014	
	Private	Public	Private	Public	Private	Public	Private	Public
Full-Professor Male	50.61	45.10	59.60	50.13	70.42	57.33	83.02	59.70
	(4.975)	(1.553)	(6.058)	(5.038)	(9.459)	(4.696)	(11.45)	(5.255)
Associate Professor Male	33.87	32.65	40.15	35.68	46.14	39.61	52.51	41.88
	(1.346)	(1.433)	(2.571)	(3.698)	(3.814)	(2.756)	(4.120)	(2.584)
Assistant Professor Male	27.42	27.02	32.91	30.45	38.84	35.23	45.21	36.92
	(1.873)	(1.880)	(3.050)	(2.633)	(4.072)	(2.750)	(4.137)	(2.950)
Instructor Male	23.73	20.30	25.94	21.92	28.81	27.47	27.87	27.94
	(3.321)	(2.330)	(3.042)	(2.517)	(6.196)	(9.397)	(3.657)	(7.829)
Full-Professor Female	43.99	40.24	54.49	45.86	64.66	51.98	77.15	53.58
	(4.806)	(2.613)	(4.613)	(4.787)	(9.093)	(4.744)	(8.128)	(4.052)
Associate Professor Female	32.12	30.42	38.16	33.63	43.26	37.01	47.40	38.86
	(1.923)	(1.330)	(2.985)	(3.056)	(3.465)	(2.572)	(9.493)	(1.889)
Assistant Professor Female	26.12	24.75	31.54	28.18	35.76	32.08	39.54	33.53
	(1.932)	(1.585)	(2.309)	(2.222)	(3.784)	(1.434)	(8.119)	(1.833)
Instructor Female	19.67	18.83	25.13	21.48	27.38	22.79	26.73	23.81
	(2.505)	(2.491)	(2.890)	(3.795)	(9.028)	(3.924)	(3.587)	(3.654)
Observations	21		21		27		17	

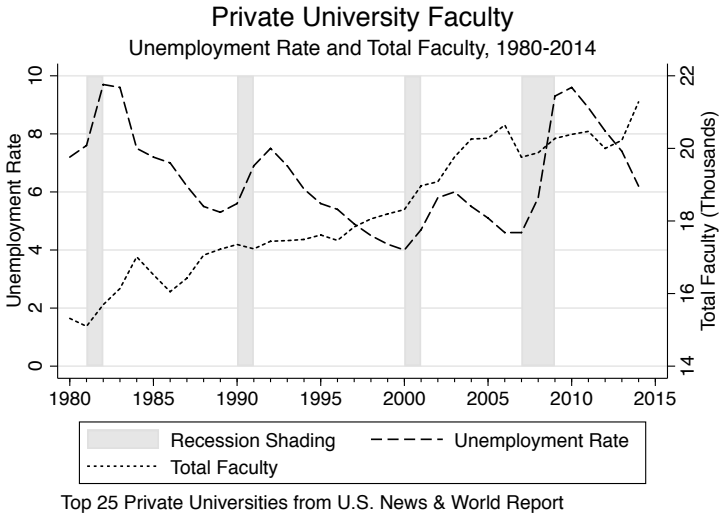
Means displayed; sd in parentheses

universally consistent increases in salary between each time period. We can also see that the increases in these salaries have seemed to diminish each in each ten-year period, for example the growth in male professor salaries increased by an approximate 11% from 1983-1994 but only 4% from 2004 to 2014, much of which is most-likely explained by the financial collapse in 2008.

Additionally, we can observe in the graphs below certain features of faculty and salary trends with respect to the unemployment rate, a major indicator variable of a recession.



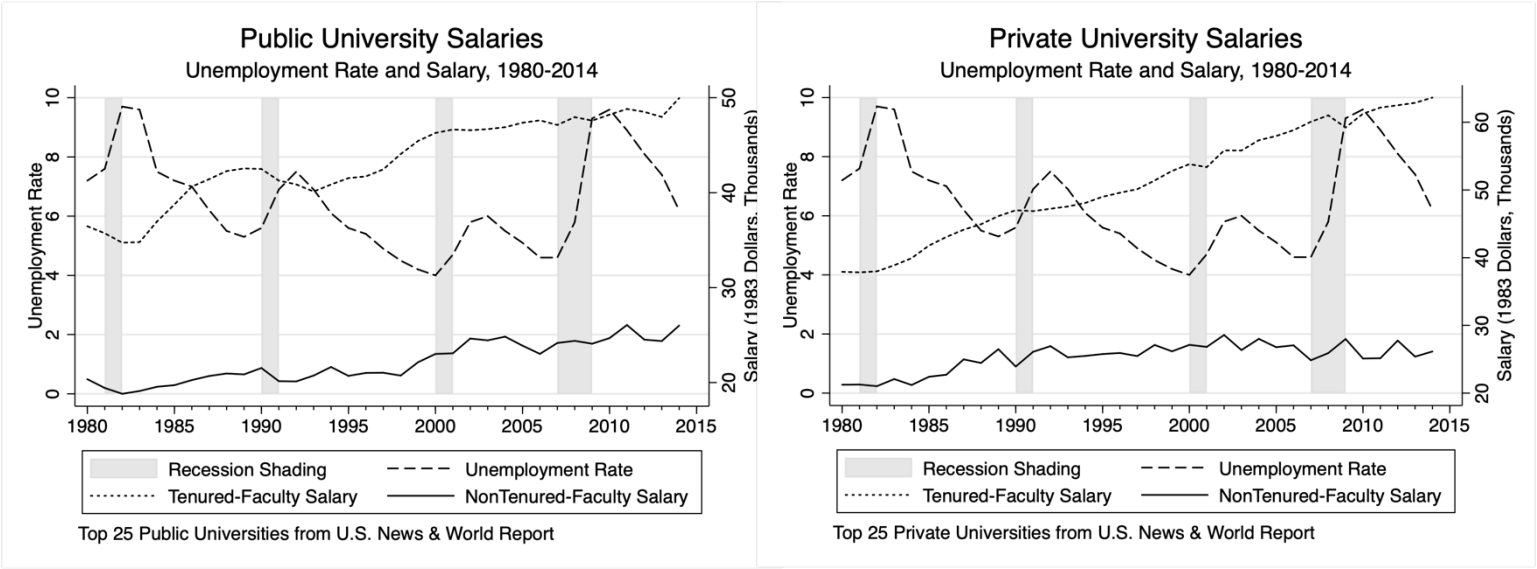
Top 25 Public Universities from U.S. News & World Report



Top 25 Private Universities from U.S. News & World Report

The graph demonstrates a tight correlation between the unemployment rate and total faculty counts in higher-education institutions. Two main features are easily discernable: first, when the unemployment rate spikes, we often witness sharp decreases in the number of faculty at both public and private institutions; second, the declines in total faculty counts appear to correspond to periods surrounding a recession. Lastly, the apparent magnitudes of the effects from the graphs would suggest that faculty at public schools are less insulated from these effects than private schools. This is demonstrated by sharper decreases in faculty count in responses to these stimuluses, and a higher degree of persistency with respect to these disadvantageous effects. For

example, the graph for public universities suggests that the number of faculty took almost ten years to recover from the recession in the early 1990s, and by 2015 had still not recovered from the devastating effects of the 2008 financial collapse. Similar results are represented in the figures for salaries featured below.



These graphs illustrate the trends of both tenure-track faculty and non-tenure-track faculty at universities in relation to recessions and the unemployment rate. While the observable magnitude of effect on salary is not as substantial as for faculty counts, we can, nonetheless, note some interesting aberrations. Specifically, while the non-tenure track salaries are ostensibly volatile, the salaries for tenure-track faculty appear to behave differently when a recession occurs, or the unemployment rate experiences large fluctuations. These changes in business cycles often halt wage growth entirely and in some cases, we can observe the wage rate decline. These effects appear to be persistent; in many cases, it takes several years for salaries to either recover to their pre-recession levels, or overcome the prevailing market forces and begin increasing again. It should be noted, it is possible universities are exercising some consumption smoothing in these periods with respect to faculty salaries that would be mitigating the adverse effects of a recession

or spike in unemployment. Lastly, with respect to the degree that public universities are worse insulated than private, the most immediate conclusion is that the salary trends for private universities appear less vulnerable to the changes in business cycles.

IV. Empirical Method

To describe changes in net faculty and salary over time we conduct within-university fixed effect regressions on each of the previously mentioned sources of faculty, namely tenure-track and non-tenure track disaggregated by sex. These regressions are run on two distinct time periods: before the 2008 financial collapse and after. The separation of time periods is based on the simple assumption that the severity of the 2008 financial crisis may have had an effect faculty that exceeded previous effects in magnitude and duration, and thereby it deserves its own analysis. This assumption was tested with a Chow test, the results of which highly suggest that we should reject the null hypothesis that the two time periods should be aggregated, and conclude that there is some sort of structural break surrounding the most recent recession.

In each period, our models take the following form:

$$(1)\quad \boldsymbol{Log(DepVar_{i,t}) = \beta_1 Urate_t + \beta_2 Urate_{t-1} + \beta_3 Urate_{t-2} + \alpha_i + \varepsilon_{i,t}}$$

$$(2)\quad \boldsymbol{Log(DepVar_{i,t}) = \beta_1 Rec_t + \beta_2 Rec_{t-1} + \beta_3 Rec_{t-2} + \alpha_i + \varepsilon_{i,t}}$$

$$(3)\quad \boldsymbol{Log(DepVar_{i,t}) = \beta_1 Urate_t + \beta_2 Urate_{t-1} + \beta_3 Urate_{t-2} + \gamma_1 Fund_{i,t} + \gamma_2 Fund_{i,t-1} + \gamma_3 Fund_{i,t-2} + \alpha_i + \varepsilon_{i,t}}$$

$$(4)\quad \boldsymbol{Log(DepVar_{i,t}) = \beta_1 Rec_t + \beta_2 Rec_{t-1} + \beta_3 Rec_{t-2} + \gamma_1 Fund_{i,t} + \gamma_2 Fund_{i,t-1} + \gamma_3 Fund_{i,t-2} + \alpha_i + \varepsilon_{i,t}}$$

Where, $DepVar_{i,t}$ is a placeholder for any of the following dependent variables for institution 'i', in year 't', each of which constitutes its own regression: number of male tenure-track faculty,

female tenure-track faculty, male instructors, female instructors, and each of their respective salaries. Rec_t is an indicator variable for whether year 't' was a recessional year, and the corresponding Rec_{t-1} and Rec_{t-2}, are one year and two year lagged measures for a recession, respectively. Log of DepVar is taken to better assess the effect size of the independent variables in consideration of the large degree of variance of faculty sizes and salaries across different institutions, for example a change of 17 tenure-track faculty may mean significantly less at University of California Los Angeles, a public university with very high numbers of faculty, than Wake Forest University, a small private school. Similarly, $Urate_t$ is a continuous variable measuring the unemployment rate in the United States in year 't', and the corresponding $Urate_{t-1}$ $Urate_{t-2}$ are one and two year lagged measures of the unemployment rate.[5] The unemployment rate is included, and given its own models, due to its simultaneous functionality as a proxy for a recession's magnitude and continuous indicator variable. $Fund_{i,t}$ refers to respective measures funding for university 'i' in year 't', and the corresponding $Fund_{i,t-1}$ and $Fund_{i,t-2}$ are one-year and two-year lagged measures of funding for universities. The Fund variable is a placeholder for either state appropriations or endowment value that corresponds to whether the school is public or private, respectively. α_i represents the within-university fixed effects, and lastly $\varepsilon_{i,t}$ is the error term corresponding to university 'i' in time 't'. The purpose of the inclusion of the funding variable is also twofold: first, to try to discern effects of funding on these faculty measures and second, to act as a robustness check for our other recession-identifying variables.

[5] Both years of recession and unemployment rate data were obtained from the publicly available FRED database.

The results of each of these regressions will reflect how recessions and funding affect university salary, salary structure and faculty size, and how those trends change over time. The fixed effect framework is appropriate for measuring the true effect of our estimators while removing the time-invariant confounding factors latent in these universities.

The expected relationship between the recession-identifying variables and our faculty measures is negative; that is to say, when a recession occurs, or when the unemployment rate spikes, faculty counts and salaries could be expected to decrease as universities struggle to cut back on spending. The opposite relationship would then be anticipated for the funding variables on faculty. Increases in funding could be expected to have some proportional increase in faculty hires and salaries, while decreases in funding would potentially result in opposite effects. Lastly, reinforcing the hypothesis of this paper, we might expect public universities to be considerably less insulated than private universities in a recession due to potentially larger fluctuations in state appropriations than endowments during periods of financial duress (Cheslock and Callie, 2015), yet this is not always true.

It has been well documented that women are underrepresented in some academic departments, namely STEM fields, and even at times overrepresented in other, less quantitative fields (Li and Koedel, 2017). While much of this may be appropriately attributed to gender discrimination, the consolidation of women in non-STEM fields may also be a cheap way of increasing a universities diversity statistics since these departments typically have lower salaries and operating costs (Li Koedel, 2017). Accordingly, women faculty may be more effected by these adverse market conditions by virtue of this consolidation and the inequitable impact of funding cuts across departments (Li et al., 2019). In fact, our evidence demonstrates that women faculty members face a larger share of the burden than male faculty, suggesting that the effect on

women could, to some extent, serve as a proxy for differentials in the impact of a recession between unobserved STEM and non-STEM departments. Thus, it is prudent to bifurcate faculty into distinct male and female components in our analysis.

There is also legitimate reason to suspect that university behavior with respect to faculty in a recession is not uniform across tenure-track groups. The job security afforded from a tenure-track position makes if very unlikely that faculty would be laid-off in response to a recession, but rather decreases come through gradual attrition. However, uniform decreases in salary are negotiable regardless of tenure-track. As the results demonstrate, declines in faculty salaries were the most prominent outcome. Additionally, given the relative rigidity of the number of tenure-track faculty and volatility of lecturers present in our data, it is judicious to disentangle the two.

V. Results: Pre-2008 Financial Collapse

For both public and private institutions, the full tables representing the results of the analysis are included in the appendix due to their multiplicity, however smaller tables are included in the text for reference to mentioned coefficients. The findings seem to suggest that there exists many interesting vulnerabilities of higher-education institutions to fluctuations in business cycles. For example, in consideration of the two models being identified, namely that with a recession indicator variable and the unemployment rate as a continuous proxy, we can observe that university faculty, in aggregate, is certainty susceptible to adverse effects of larger-domestic market trends. To best identify the veracity of our hypothesis, namely that faculty at public universities is less insulated from recessions than their private counterpart, we will separately investigate each institutional domain before exploring the between-group differences.

i. Male Faculty at Public Universities vs Private, Model 1

Looking at public schools, we will first consider the effect of faculty from business cycles as determined by the recession indicator variable.

Table I: Faculty Counts and Salaries, Male, Public vs. Private, 1983-2008

	Public				Private			
	(1) Log (Male Ten. Faculty)	(2) Log (Male Instr.)	(3) Log (MalSal Ten.)	(4) Log (MalSal Non-Ten.)	(1) Log (Male Ten. Faculty)	(2) Log (Male Instr.)	(3) Log (MalSal Ten.)	(4) Log (MalSal Non-Ten.)
Recession	0.026***	0.131*	0.023***	0.020	0.006	-0.013	0.023***	0.022
	(0.006)	(0.069)	(0.005)	(0.017)	(0.006)	(0.093)	(0.006)	(0.034)
Recession L1	0.016**	-0.163	-0.009*	0.024	-0.012	-0.061	0.003	0.017
	(0.006)	(0.114)	(0.005)	(0.025)	(0.010)	(0.077)	(0.004)	(0.022)
Recession L2	0.004	0.055	-0.062***	-0.071***	-0.004	0.002	-0.060***	-0.015
	(0.008)	(0.079)	(0.003)	(0.020)	(0.011)	(0.061)	(0.006)	(0.018)
Constant	6.811***	2.276***	10.725***	3.139***	6.251***	2.039***	10.872***	3.287***
	(0.001)	(0.024)	(0.001)	(0.004)	(0.002)	(0.025)	(0.001)	(0.007)
Observations	624	469	617	342	621	435	604	261
University FE	YES	YES	YES	YES	YES	YES	YES	YES

Standard errors in parentheses
* p<0.1 ** p<0.05 *** p<0.01

Columns enumerated (1) and (2) from *Table I* suggests that while faculty is affected in a recession, it may not always occur in the number of faculty, but often just their salaries. Column I in particular for public schools, suggests that the number of tenure-track male faculty is relatively unresponsive to a recession; this is revealed by coefficients of 0.026 on the current indicator variable for a recession, and 0.016 on the one-year lagged measure, each of which are statistically significant at the 1% level. We would interpret these variables in the following manner: a recession in the current year resulted in the number of male-tenure-track faculty to increase by 2.6% whereas if a recession occurred a year ago we would expect the number of faculty to increase by 1.6%. It should be explicitly mentioned that these coefficients are in the opposite direction of our hypothesis, and this is often the case when looking at the *current* year in which a recession occur. This could be explained by existence of a reasonable delay from the year in which the recession occurs to the time in which it actually impacts university budgets, and therefore we are more concerned with the one-year and two-year lags.

Columns enumerated (2) in the *appendix* tables, are included both as means of measuring the degree to which funding acted as a lever in influencing university faculty, and as a robustness check for our recession indicators. To that end, the inclusion of the appropriate funding variable for public universities—state appropriations—had a minuscule influence on the coefficients for recessions. For male-tenure-track faculty, the inclusion of state appropriations appears to have shifted the magnitude and significance of the one-year recession lag onto the two. We also observe in this model a coefficient of 0.008 on a one-year lagged state appropriations term, which would indicate that for an increase of 10 million dollars in state appropriations to universities (average state appropriations equal 150 million dollars), we would expect faculty to increase by 0.8%. A similar story exists for male-non-tenure-track faculty; according to this model, the number of instructors increases when there is a recession, but the effects occur where we would perhaps expect them to in absence of a recession. In other words, it is reasonable here to say that this model suggests that male faculty is not exceptionally vulnerable to a recession, especially when the effect is mostly isolated to the current year.

The majority of the impact on faculty from this model is experienced in faculty salaries. According to this model and *Table I*, with coefficients of -0.009 and -0.062 for the lagged recession terms, tenure-track male faculty experience a 0.9% decline in their salary if the recession occurred a year ago and an additional 6.2% decrease in salary if the recession occurred two years prior. The robustness check of including state appropriations results in a coefficient with the same direction and similar magnitude for the two-year lag and even increases the magnitude for the one-year lag from 0.9% to a 2% decrease. As for male instructors, in the model absent of state appropriations the statistically significant effect is for a two-year lagged recession indicator, with a coefficient of 0.71, however when state appropriations are included,

the coefficient entirely changes direction while maintain the same magnitude, so we can say that this coefficient does not pass the robustness check. In addition, the one-year lag of state appropriations in *Table I* indicates that a decrease of 10 million dollars in state appropriations would cause over a 4% decrease in the number of male instructors which gives some credence to the notion that state appropriation funding has some bearing on university faculty.

The results from *Table I* communicate a lack of evidence that the number of male faculty at private universities is impacted by a recession. Contrasted with the positive effect for public schools, this may suggest that private universities are more insulated in terms of number of faculty. Despite this outcome, there is evidence that this type of faculty experiences a decrease in earnings from this event, specifically for tenure-track males. In this group, they experience approximately a 6 percent decrease in salary if the recession began two years prior. The robustness check reinforces this finding while expanding the earnings impact to an approximate 3% on a one-year lag.[6] In addition to this finding, the table shows that a decrease in an endowment of one-hundred million (average endowment of 2.5 billion in 1983 dollars) leads to a 1% decrease in the number of male instructors, and a 0.2% decrease in the salaries of tenure-track males if it occurred two years prior, and a 0.2% decrease in the salaries of tenure-track males if it occurred one year prior. Once again, the lack of an effect for private universities on non-tenure track faculty where there is an effect for public institutions may further suggest that private universities are more insulated, according to this model.

ii. Female Faculty at Public Universities vs Private, Model 1

This narrative of university response to a recession is slightly different for female-tenure-track professors. Columns (1) for public universities in *Table II* indicate that if a recession occurs

[6] See *Table I* in the appendix

two years ago, the number of female professors employed today will decline by approximately 12.5%. When state-appropriations are included in this model as a robustness check, the direction of the effect on the two-year lag stays the same, however the magnitude is dispersed between the one-year and two-year measures, with a decline of eight percent and seven percent respectively. Women at these private universities faced harsher penalties from the recession than men. The two-year lagged recession term resulted in an 11% decrease in the number of female-tenure track faculty and a 7% decrease in the salaries for women regardless of rank.

Table II: Faculty Counts and Salaries, Female, Public vs. Private, 1983-2008

	Public				Private			
	(1) Log (Female Ten. Faculty)	(2) Log (Female Instr.)	(3) Log (FemSal Ten.)	(4) Log (FemSal Non-Ten.)	(1) Log (Female Ten. Faculty)	(2) Log (Female Instr.)	(3) Log (FemSal Ten.)	(4) Log (FemSal Non-Ten.)
Recession	0.062***	0.066	0.013	0.001	0.040**	-0.055	0.031***	0.001
	(0.013)	(0.040)	(0.009)	(0.013)	(0.015)	(0.095)	(0.006)	(0.026)
Recession L1	-0.015	-0.051	-0.014**	0.003	-0.030	0.057	0.005	0.066*
	(0.014)	(0.092)	(0.006)	(0.020)	(0.022)	(0.089)	(0.006)	(0.035)
Recession L2	-0.126***	0.129*	-0.075***	-0.064***	-0.113***	0.053	-0.076***	-0.066***
	(0.010)	(0.070)	(0.004)	(0.012)	(0.013)	(0.058)	(0.010)	(0.018)
Constant	5.583***	2.486***	10.515***	3.059***	4.913***	1.807***	10.645***	3.196***
	(0.003)	(0.017)	(0.002)	(0.003)	(0.004)	(0.028)	(0.002)	(0.007)
Observations	624	462	616	350	621	419	601	219
University FE	YES	YES	YES	YES	YES	YES	YES	YES

Standard errors in parentheses
* p<0.1 ** p<0.05 *** p<0.01

As was true for female faculty counts, this model indicates that women faculty salaries are more vulnerable than their male counterpart. *Table II* demonstrates nearly uniform 6-8% decreases in female faculty salaries for the two-year lagged recession indicator, both tenure-and-non-tenure track included. The consistency of the estimation across robustness checks assists in confirming its proper identification[7]. The table also demonstrates that the reduction in salaries for female faculty is not only more sensitive to these market vulnerabilities, but is also more

[7] See *Table II* and *Table XI* in the appendix

persistent than salaries for male faculty at public universities, given these explanatory variables and juxtaposed with *Table I*. Under this model women faculty face wage reductions both at the time in which the recession occurs, and again a few years later. Part of this inequitable distribution of adverse effects could be explained by gender differentials in departments. Specifically, between the period of 2004 to 2018, fields with often higher proportions of female faculty relative to male such as the Social Sciences, English and Literature, and Foreign Languages experienced decreases on the order or 30% or higher in the percentage change of new assistant professors hired whereas Health, Engineering, and Business related departments had increases of 30% or more in the percentage change of new assistant professors hired (Li et al., 2019). It also may be the case that there is discrimination occurring with respect to higher education institutions targeting female faculty in budget-cutting maneuvers.

iii. Male Faculty at Public Universities vs Private, Model 2

The next model run to identify the impact on faculty reinforces and expands on these results. *Table III* and *Table IV* look at faculty and salaries with the unemployment rate as the primary explanatory variable. These results generally demonstrate much higher degrees of faculty impacts from fluctuations in the continuous variables rather than the recession indicator.

Table III: Faculty Counts and Salaries, Male, Public vs. Private, 1983-2008

	Public				Private			
	(1) Log (Male Ten. Faculty)	(2) Log (Male Instr.)	(3) Log (MalSal Ten.)	(4) Log (MalSal Non-Ten.)	(1) Log (Male Ten. Faculty)	(2) Log (Male Instr.)	(3) Log (MalSal Ten.)	(4) Log (MalSal Non-Ten.)
URate	0.015*	0.100	-0.024***	-0.005	-0.006	0.012	-0.036***	-0.022
	(0.008)	(0.087)	(0.003)	(0.018)	(0.006)	(0.072)	(0.002)	(0.018)
URate L1	-0.007	-0.161**	-0.003	-0.014	0.005	-0.038	0.014***	0.026
	(0.006)	(0.062)	(0.003)	(0.022)	(0.007)	(0.067)	(0.003)	(0.016)
URate L2	-0.009	0.159***	-0.030***	-0.030*	-0.009*	0.075	-0.059***	-0.042**
	(0.010)	(0.043)	(0.003)	(0.015)	(0.005)	(0.048)	(0.003)	(0.018)
Constant	6.823***	1.691***	11.057***	3.424***	6.313***	1.722***	11.347***	3.511***
	(0.074)	(0.478)	(0.018)	(0.084)	(0.043)	(0.309)	(0.021)	(0.110)
Observations	624	469	617	342	621	435	604	261
University FE	YES	YES	YES	YES	YES	YES	YES	YES

Standard errors in parentheses
* p<0.1 ** p<0.05 *** p<0.01

Notably, *Table III* illustrates that the number of male instructors decreases by approximately 16% the year after the unemployment rate increases by 1%, on average holding all else constant. This effect is relatively insensitive to the introduction of state appropriations. The outcome that further distinguishes this model from the previous is the enduring effect on male faculty salaries; according to this model, tenure-track male salaries decrease by 3% given a 1% increase in the unemployment rate, both in the year in which the unemployment rate spikes, and two-years after. Male instructors also face a 3% decrease in their salaries given the same change, however this effect is isolated to the two-year lag. Again, these results are highly insensitive to the introduction of funding variables in the model, demonstrating their robustness.[8]

As for private universities, in our second model results we can see more evidence of the negative implications of such an event on faculty. For example, in *Table VII*, there is evidence with this model that male faculty is impacted by a recession, however the violent oscillations are somewhat muted when compared to public universities. The only statistically significant coefficient for private universities corresponding to the number of male faculty suggests that if a recession occurs two-years ago, the number of male tenure-track faculty decreases by approximately 1%. Despite lackluster and enduring effects on male faculty in this model, we can observe that earnings at private universities were more heavily impact than at public universities given an increase in the unemployment rate.

iv. Female Faculty at Public Universities vs Private, Model 2

Taking into consideration female faculty in *Table IV*, we see large impacts on the number of women faculty and their earnings. The table tells us that for 1% increase in the unemployment rate in a given year, the number of female faculty on the tenure track declines by 11%, given a

[8] See *Table III* in the appendix

coefficient of -0.109, at public universities. Even more, for every 1% increase in the

Table IV: Faculty Counts and Salaries, Female, Public vs. Private, 1983-2008

	Public				Private			
	(1) Log (Female Ten. Faculty)	(2) Log (Female Instr.)	(3) Log (FemSal Ten.)	(4) Log (FemSal Non-Ten.)	(1) Log (Female Ten. Faculty)	(2) Log (Female Instr.)	(3) Log (FemSal Ten.)	(4) Log (FemSal Non-Ten.)
URate	-0.109***	0.068	-0.041***	-0.029*	-0.136***	-0.078	-0.045***	-0.020
	(0.011)	(0.072)	(0.005)	(0.017)	(0.015)	(0.063)	(0.004)	(0.015)
URate L1	0.056***	-0.025	0.006	0.006	0.090***	0.127*	0.018***	0.002
	(0.012)	(0.068)	(0.004)	(0.019)	(0.015)	(0.065)	(0.005)	(0.013)
URate L2	-0.151***	0.044	-0.039***	-0.032*	-0.167***	-0.108*	-0.072***	-0.037**
	(0.016)	(0.066)	(0.003)	(0.015)	(0.012)	(0.063)	(0.005)	(0.017)
Constant	6.779***	2.005***	10.938***	3.370***	6.154***	2.173***	11.223***	3.521***
	(0.102)	(0.472)	(0.020)	(0.084)	(0.082)	(0.336)	(0.026)	(0.080)
Observations	624	462	616	350	621	419	601	219
University FE	YES	YES	YES	YES	YES	YES	YES	YES

Standard errors in parentheses
* p<0.1 ** p<0.05 *** p<0.01

unemployment rate two-years prior, the number of female-tenure-track faculty declines by an additional ~15%. As desired, the magnitude and directions of these coefficients are preserved with the robustness check[9]. While there is no evidence in the data that number of female instructors at public universities are harmed by this continuous recession variable, there are uniform decreases in earnings for female faculty, regardless of rank, on the order of three to 4%. These results augment the existing evidence from the previous model that women faculty fares worse during a recession than male. In many instances, each of these models features very high within-r-squared values, indicating that these models are fitting the actual values adequately, and providing decent justification we are explaining a substantial portion of the story. Additionally, as was demonstrated with the previous model the impact on women remains larger and more persistent than for men, as is clear from *Table IV*. Where there is no effect on men, there is often an effect on women, and where an effect on men exists, the impact on women is almost always larger. The impact on women across public versus private institutions is, in this case, apparent.

[9] See *Table IV* and *Table VIII* in the appendix.

Uniformly, across the two-year lag we witness larger decreases in the number of faculty and their respective salaries at private universities than public.

When it comes to measuring a recession's impact on faculty, the action occurs largely where we would expect: many of the repercussions occur in the lagged measures of the independent variables, as it does in these models; it is plausible that higher-education in general is slightly more insulated than other parts of the economy due to the nature of their revenue sources, and thus it may take more time for the inauspicious effects of a recession to thoroughly penetrate the academic market.

iv. Discussion and Summary

Ultimately, and perhaps surprisingly, this paper finds little evidence that faculty at public higher education institutions are more vulnerable to economic downturns than faculty at private institutions. Instead, our paper in fact suggests that private universities fare worse, at least in consideration of the second model. Acknowledging that, when it comes to capturing the whole picture, examining which faculty was more susceptible to these adverse market conditions depended on more than just whether the institution had state ownership, including: tenure-track status, sex, and the primary independent variable. Our conclusions also rely on whether we were more concerned with the number of faculty as the primary outcome of interest, or their salaries, which did not experience consistently similar impacts.

As we can see from *Table I*, there was little reasonable evidence from this models that the number of male faculty was impacted between public and private, however in both instances there are decreases in earnings; the decline in salary for public universities was larger than that for private, but only slightly. As for women in the first model, we can ascertain that the impact on the number of female faculty was larger at public schools, however the impact on salaries was

about the same regardless of the type of institution, as can be seen in *Table II*. According to the second model with the unemployment rate, men at private universities face worse repercussions from a recession than male faculty at public universities both in terms of the number of people expected to be laid off, and the expected declines in earnings, as is substantiated by in *Table III*. Lastly, looking at *Table IV* we can examine the degree to which women are worse-off at public universities than private, given the second model. The results of the model suggest that women at private universities are impacted more than women at public universities in the event of a recession both in terms of the number of lay-offs and reductions in earnings. Tenure-track women at private higher education face an approximate 10% higher rate of lay-offs than public, with a coefficient of -0.167 at private universities and -0.151 at public on the two-year lag of an increase of 1% in the unemployment rate. The decreases in salary range from 20% higher at private institutions for female instructors, to an approximate 85% higher for women on the tenure track.[10] Again, the inequitable impact on women faculty may be largely explained by their overrepresentation in not STEM disciplines, and underrepresentation in the converse.

VI. Results: Post-2008 Financial Collapse

This paper focused on the data prior to the financial collapse separately from post-financial collapse for a few important reasons. Notably, in terms of the data available, the severity the 2008 recession exceeded the magnitude of any other observed recession in our data. In consideration of this, and the fact that state appropriations had been steadily declining, it is reasonable to assume that universities were especially fragile and vulnerable to the most recent collapse. We used a Chow test to assess whether or not there was a structural break in this time

[10] It should be acknowledged that each of these models were run with a time trend. When included, some of the coefficients for number of faculty completely loss their significance. Coefficients for salary became smaller in magnitude but mostly retained their significance.

period, the results of which were conclusive: the great-recession was different from the prior economic downturns in terms of its effect on faculty. The results of our analysis in this period however, were much less emphatic.

Our results for after the 2008 financial collapse are small in magnitude and null in entirety, and we have therefore decided to exclude their regression results in the interest conciseness. There are a few different reasons why the lack of evidence of an effect is so abundant. First, referring back to the graphs earlier in this paper, we can observe that the fluctuations in faculty for the great recession seemed to have preceded the actual spike in the unemployment rate which suggests that in this case, the decline in faculty cannot be properly identified by the unemployment rate as the explanatory variable. Second, based on the graphs we can also notice that the faculty counts do not recover after the recession in the event window provided by the data, which leads us to believe that we would need a more comprehensive dataset, specifically more observations after 2014, to determine the true effects. The third possible justification is that due to the inconsistency, or complete absence of reporting in the funding variables for public and private universities after approximately 2015, that there might not be enough evidence ascertained to properly determine the effects.

VII. Conclusion

The gradual attrition of funding to higher education institutions, specifically public, is taking its toll. The persistency in the recent abatements in revenue for universities is perilous for both the quality of education in the United States, as well as the hundreds of thousands of employed faculty at these institutions. Despite increasing tuition levels for colleges, this paper has demonstrated that it's not enough: cost-cutting measures are still being taken to keep the doors

open. The recent and particularly harsh declines in revenue contemporaneous with broad shocks in the business cycles from recessions potentially leaves faculty more vulnerable than ever.

Given that endowments for private universities generally fare better than state appropriations for public colleges, we could witness fundamental changes in the structure of higher education in the upcoming decades (Cheslock and Callie, 2015). Institutions with worsening financial situations will struggle to compete with those that have stable, and often abundant, revenue sources even if they make expenditure adjustments. As it so happens, this paper shows that these expenditure-cutting adjustments indeed were made nonetheless. In the end, it is not the case that public university faculty fared worse than private across the board. Determining who was worse off depended on each of the following factors: tenure-track status, sex, the number of faculty versus their salaries, and the model. We can say, however, that prior to 2008, concurrent with a recession or slightly after, both public and private institutions experienced significant declines in the number of faculty. These decreases in the number of professors was on the order of 15% or higher, and almost always accompanied with earnings reductions for those who kept their jobs. Women were impacted more than men across both public and private colleges. The abundance of null results post-2008 could indicate that faculty was substantially less vulnerable, but is more likely the case that the evidence was insufficient for demonstrating the degree to which they were harmed by the financial collapse and the accompanying recession.

Our findings raise a number of important questions with regards to higher education in the U.S. that future research can address. Some of these include: Can public universities remain competitive with private universities going forward given the gradual and persistent declines in state funding? How was faculty affected by the 2008 financial collapse and the aftermath? To what extent was faculty productivity impeded by these financial difficulties and to what extent

has that trend change over time? What are the impacts on the quality of higher education when measuring faculty per student and funding per student rather than in aggregate? What is the effect of these explanatory on the number of new-faculty members hired? Future research on this issue would also benefit from looking at other sources of revenue for universities besides endowments and state appropriations such as the availability of research grants, federal aid, and local property tax income. Cheslock and Callie (2015) quote a Business School Dean: “I work 10 times as hard keeping money from going out the back door as I do keeping money coming in the front door.” These topics, while beyond the scope of this paper, are worthwhile and valuable topics for future studies.

Appendix

Table I: Logged Faculty Counts and Salaries, Public Universities, Male, 1983-2008

	Log (Male Ten. Faculty)		Log (Male Instr.)		Log (MalSal Ten.)		Log (MalSal Non-Ten.)	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
Recession	0.026***	0.012***	0.128*	0.194***	0.023***	0.013	0.020	0.008
	(0.006)	(0.004)	(0.069)	(0.073)	(0.005)	(0.009)	(0.017)	(0.013)
Recession L1	0.016***	0.001	-0.158	-0.108	-0.008*	-0.020**	0.024	-0.002
	(0.006)	(0.008)	(0.114)	(0.111)	(0.005)	(0.008)	(0.025)	(0.034)
Recession L2	0.004	0.015**	0.050	0.053	-0.062***	-0.052***	-0.070***	-0.072***
	(0.008)	(0.006)	(0.079)	(0.074)	(0.003)	(0.006)	(0.020)	(0.019)
State App.		-0.000		-0.010		0.002		-0.006
		(0.003)		(0.020)		(0.002)		(0.009)
State App. L1		0.008**		-0.043***		0.002		0.000
		(0.004)		(0.016)		(0.002)		(0.005)
State App. L2		0.003		-0.026		0.005		0.019**
		(0.003)		(0.018)		(0.003)		(0.008)
Constant	6.810***	6.658***	1.990***	3.187***	10.726***	10.610***	3.161***	2.983***
	(0.078)	(0.142)	(0.236)	(0.394)	(0.017)	(0.059)	(0.042)	(0.096)
Observations	624	606	469	463	617	600	342	339
University FE	YES	YES	YES	YES	YES	YES	YES	YES
R-Sq Within	0.012	0.040	0.009	0.065	0.084	0.105	0.039	0.084
R-Sq Overall	0.001	0.314	0.002	0.009	0.045	0.118	0.007	0.011
R-Sq Between	0.008	0.356	0.205	0.143	0.002	0.140	0.177	0.015
Chi-Squared	32.068	43.664	6.002	32.521	698.601	320.687	15.096	32.309
Chi P-Value	0.000	0.000	0.111	0.000	0.000	0.000	0.002	0.000

Standard errors in parentheses
* p<0.1 ** p<0.05 *** p<0.01

Table II: Logged Faculty Counts and Salaries, Public Universities, Female, 1983-2008

	Log (Fem. Ten. Faculty)		Log (Fem. Instr.)		Log (FemSal Ten.)		Log (FemSal Non-Ten.)	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
Recession	0.062***	0.031	0.065	0.159***	0.013	0.001	0.000	-0.012
	(0.013)	(0.024)	(0.041)	(0.054)	(0.009)	(0.012)	(0.013)	(0.013)
Recession L1	-0.015	-0.080**	-0.046	-0.005	-0.014**	-0.028***	0.002	-0.010
	(0.014)	(0.031)	(0.092)	(0.095)	(0.006)	(0.009)	(0.020)	(0.029)
Recession L2	-0.126***	-0.071***	0.126*	0.156***	-0.075***	-0.060***	-0.064***	-0.054***
	(0.010)	(0.019)	(0.070)	(0.057)	(0.004)	(0.006)	(0.011)	(0.012)
State App.		0.003		-0.005		0.003		0.009
		(0.009)		(0.029)		(0.003)		(0.007)
State App. L1		-0.005		-0.052**		0.000		-0.009**
		(0.006)		(0.024)		(0.002)		(0.003)
State App. L2		0.026*		-0.027		0.006		0.014
		(0.014)		(0.018)		(0.004)		(0.009)
Constant	5.583***	5.249***	2.299***	3.545***	10.516***	10.379***	3.080***	2.867***
	(0.097)	(0.267)	(0.252)	(0.560)	(0.018)	(0.060)	(0.033)	(0.092)

Observations	624	606	462	456	616	599	350	347
University FE	YES	YES	YES	YES	YES	YES	YES	YES
R-Sq Within	0.029	0.030	0.005	0.061	0.079	0.106	0.037	0.108
R-Sq Overall	0.009	0.200	0.001	0.014	0.048	0.115	0.010	0.062
R-Sq Between	0.000	0.286	0.154	0.163	0.008	0.142	0.006	0.212
Chi-Squared	179.247	43.563	9.281	32.499	521.316	266.391	32.261	84.009
Chi P-Value	0.000	0.000	0.026	0.000	0.000	0.000	0.000	0.000

Standard errors in parentheses
* p<0.1 ** p<0.05 *** p<0.01

Table III: Logged Faculty Counts and Salaries, Public Universities, Male, 1983-2008

	Log (Male Ten. Faculty)		Log (Male Instr.)		Log (MalSal Ten.)		Log (MalSal Non-Ten.)	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
URate	0.015**	0.010	0.106	0.122*	-0.024***	-0.029***	-0.005	-0.005
	(0.008)	(0.009)	(0.087)	(0.071)	(0.003)	(0.003)	(0.017)	(0.016)
URate L1	-0.007	-0.003	-0.169***	-0.172***	-0.003	0.003	-0.012	-0.016
	(0.006)	(0.007)	(0.061)	(0.058)	(0.003)	(0.003)	(0.022)	(0.019)
URate L2	-0.009	0.001	0.164***	0.135***	-0.030***	-0.034***	-0.031**	-0.026*
	(0.010)	(0.009)	(0.043)	(0.046)	(0.003)	(0.004)	(0.015)	(0.015)
State App.		-0.000		-0.006		0.001		0.001
		(0.003)		(0.019)		(0.001)		(0.006)
State App. L1		0.008**		-0.043**		-0.000		-0.003
		(0.004)		(0.018)		(0.001)		(0.004)
State App. L2		0.003		-0.018		0.003*		0.006
		(0.002)		(0.023)		(0.001)		(0.005)
Constant	6.823***	6.620***	1.408***	2.532***	11.058***	11.029***	3.443***	3.384***
	(0.067)	(0.100)	(0.532)	(0.846)	(0.025)	(0.040)	(0.112)	(0.155)
Observations	624	606	469	463	617	600	342	339
University FE	YES	YES	YES	YES	YES	YES	YES	YES
R-Sq Within	0.018	0.040	0.037	0.076	0.531	0.521	0.169	0.166
R-Sq Overall	0.001	0.318	0.017	0.014	0.285	0.355	0.063	0.056
R-Sq Between	0.008	0.360	0.199	0.168	0.018	0.252	0.002	0.010
Chi-Squared	36.312	48.277	19.276	58.178	413.531	360.028	37.657	63.394
Chi P-Value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Standard errors in parentheses
* p<0.1 ** p<0.05 *** p<0.01

Table IV: Logged Faculty Counts and Salaries, Public Universities, Female, 1983-2008

	Log (Female Ten. Faculty)		Log (Female Instr.)		Log (FemSal Ten.)		Log (FemSal Non-Ten.)	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
URate	-0.109***	-0.119***	0.073	0.085	-0.041***	-0.046***	-0.030*	-0.030*
	(0.011)	(0.017)	(0.072)	(0.070)	(0.005)	(0.006)	(0.017)	(0.016)
URate L1	0.056***	0.052***	-0.030	-0.007	0.006	0.012*	0.007	0.009
	(0.012)	(0.016)	(0.068)	(0.064)	(0.004)	(0.006)	(0.018)	(0.017)
URate L2	-0.151***	-0.137***	0.049	-0.002	-0.039***	-0.042***	-0.032**	-0.030*
	(0.016)	(0.016)	(0.066)	(0.069)	(0.003)	(0.004)	(0.015)	(0.016)
State App.		-0.006		0.003		0.002		0.011**
		(0.008)		(0.026)		(0.001)		(0.005)
State App. L1		-0.012**		-0.049*		-0.002		-0.012***

		(0.006)		(0.026)		(0.001)		(0.003)
State App. L2		0.019**		-0.027		0.004**		0.008
		(0.009)		(0.016)		(0.002)		(0.007)
Constant	6.779***	6.767***	1.797***	3.009***	10.938***	10.893***	3.391***	3.265***
	(0.080)	(0.197)	(0.514)	(0.793)	(0.029)	(0.041)	(0.103)	(0.117)
Observations	624	606	462	456	616	599	350	347
University FE	YES	YES	YES	YES	YES	YES	YES	YES
R-Sq Within	0.500	0.452	0.017	0.060	0.580	0.562	0.222	0.232
R-Sq Overall	0.164	0.133	0.017	0.017	0.352	0.411	0.096	0.131
R-Sq Between	0.000	0.018	0.434	0.173	0.025	0.268	0.004	0.191
Chi-Squared	174.255	181.028	1.418	15.382	640.845	605.902	31.743	119.758
Chi P-Value	0.000	0.000	0.701	0.017	0.000	0.000	0.000	0.000

Standard errors in parentheses

* p<0.1 ** p<0.05 *** p<0.01

Table V: Logged Faculty Counts and Salaries, Private Universities, Male, 1983-2008

	Log (Male Ten. Faculty)		Log (Male Instr.)		Log (MalSal Ten.)		Log (MalSal Non-Ten.)	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
Recession	0.006	0.003	-0.013	-0.055	0.023***	-0.005	0.017	-0.021
	(0.006)	(0.008)	(0.093)	(0.104)	(0.006)	(0.007)	(0.033)	(0.042)
Recession L1	-0.012	-0.011	-0.062	0.126	0.002	-0.035***	0.020	0.001
	(0.010)	(0.010)	(0.077)	(0.091)	(0.004)	(0.006)	(0.023)	(0.020)
Recession L2	-0.004	0.005	-0.001	-0.045	-0.060***	-0.028***	-0.021	0.016
	(0.011)	(0.007)	(0.061)	(0.071)	(0.006)	(0.007)	(0.019)	(0.017)
Endow.		0.000		-0.000		-0.000		0.001
		(0.000)		(0.005)		(0.000)		(0.001)
Endow. L1		0.000***		-0.002		0.002***		-0.002
		(0.000)		(0.006)		(0.000)		(0.002)
Endow. L2		0.000*		0.010***		0.002***		0.002*
		(0.000)		(0.003)		(0.000)		(0.001)
Constant	6.250***	6.231***	1.853***	1.668***	10.874***	10.859***	3.327***	3.367***
	(0.079)	(0.077)	(0.167)	(0.198)	(0.021)	(0.023)	(0.050)	(0.072)
Observations	621	440	435	281	604	435	261	196
University FE	YES	YES	YES	YES	YES	YES	YES	YES
R-Sq Within	0.004	0.070	0.002	0.057	0.042	0.434	0.005	0.019
R-Sq Overall	0.000	0.136	0.001	0.029	0.026	0.444	0.007	0.059
R-Sq Between	0.006	0.189	0.009	0.034	0.033	0.427	0.012	0.008
Chi-Squared	6.718	15.386	0.685	173.708	209.741	217.310	2.757	15.653
Chi P-Value	0.081	0.017	0.877	0.000	0.000	0.000	0.431	0.016

Standard errors in parentheses

* p<0.1 ** p<0.05 *** p<0.01

Table VI: Logged Faculty Counts and Salaries, Private Universities, Female, 1983-2008

	Log (Fem. Ten. Faculty)		Log (Fem. Instr.)		Log (FemSal Ten.)		Log (FemSal Non-Ten.)	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
Recession	0.040***	-0.006	-0.053	-0.150	0.031***	0.007	-0.008	-0.046*

	(0.015)	(0.022)	(0.095)	(0.112)	(0.006)	(0.006)	(0.025)	(0.025)
Recession L1	-0.030	-0.151***	0.056	0.157	0.005	-0.044***	0.074**	0.033
	(0.022)	(0.022)	(0.089)	(0.111)	(0.006)	(0.009)	(0.033)	(0.028)
Recession L2	-0.113***	-0.055***	0.052	0.108	-0.077***	-0.041***	-0.070***	-0.046*
	(0.013)	(0.014)	(0.058)	(0.104)	(0.010)	(0.012)	(0.017)	(0.025)
Endow.		0.003***		0.001		0.000		0.001
		(0.001)		(0.007)		(0.000)		(0.001)
Endow. L1		0.002**		-0.002		0.003***		-0.002
		(0.001)		(0.011)		(0.000)		(0.002)
Endow. L2		0.003***		0.014***		0.001***		0.003***
		(0.001)		(0.005)		(0.000)		(0.001)
Constant	4.914***	4.920***	1.690***	1.497***	10.647***	10.631***	3.203***	3.230***
	(0.106)	(0.103)	(0.217)	(0.316)	(0.022)	(0.026)	(0.039)	(0.053)
Observations	621	440	419	267	601	433	219	153
University FE	YES	YES	YES	YES	YES	YES	YES	YES
R-Sq Within	0.022	0.377	0.003	0.101	0.046	0.417	0.050	0.061
R-Sq Overall	0.006	0.125	0.001	0.001	0.032	0.384	0.042	0.114
R-Sq Between	0.006	0.072	0.084	0.002	0.047	0.341	0.227	0.085
Chi-Squared	162.022	678.459	4.651	16.787	192.888	268.138	32.313	44.525
Chi P-Value	0.000	0.000	0.199	0.010	0.000	0.000	0.000	0.000

Standard errors in parentheses

* p<0.1 ** p<0.05 *** p<0.01

Table VII: Logged Faculty Counts and Salaries, Private Universities, Male, 1983-2008

	Log (Male Ten. Faculty)		Log (Male Instr.)		Log (MalSal Ten.)		Log (MalSal Non-Ten)	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
URate	-0.006	-0.009	0.007	0.006	-0.036***	-0.032***	-0.023	-0.025
	(0.006)	(0.011)	(0.071)	(0.104)	(0.002)	(0.005)	(0.018)	(0.025)
URate L1	0.005	0.015	-0.035	0.022	0.014***	0.022***	0.026	0.046
	(0.007)	(0.011)	(0.066)	(0.114)	(0.003)	(0.005)	(0.016)	(0.028)
URate L2	-0.009*	-0.015*	0.069	-0.016	-0.059***	-0.035***	-0.041**	-0.032
	(0.005)	(0.008)	(0.047)	(0.078)	(0.003)	(0.003)	(0.017)	(0.022)
Endow.		0.000		-0.000		-0.000		0.001
		(0.000)		(0.005)		(0.001)		(0.001)
Endow. L1		0.000**		-0.002		0.001***		-0.002
		(0.000)		(0.007)		(0.000)		(0.002)
Endow. L2		0.000*		0.010***		0.002***		0.002**
		(0.000)		(0.003)		(0.000)		(0.001)
Constant	6.312***	6.279***	1.578***	1.615***	11.350***	11.105***	3.566***	3.427***
	(0.071)	(0.076)	(0.377)	(0.476)	(0.033)	(0.033)	(0.134)	(0.138)
Observations	621	440	435	281	604	435	261	196
University FE	YES	YES	YES	YES	YES	YES	YES	YES
R-Sq Within	0.027	0.077	0.020	0.048	0.580	0.506	0.072	0.022
R-Sq Overall	0.001	0.126	0.000	0.030	0.358	0.475	0.054	0.057
R-Sq Between	0.009	0.188	0.209	0.064	0.071	0.437	0.059	0.009
Chi-Squared	3.431	42.332	2.742	98.669	553.787	380.155	5.765	14.837

Chi P-Value	0.330	0.000	0.433	0.000	0.000	0.000	0.124	0.022

Standard errors in parentheses
* p<0.1 ** p<0.05 *** p<0.01

Table VIII: Logged Faculty Counts and Salaries, Private Universities, Female, 1983-2008

	Log (Fem. Ten. Faculty)		Log (Fem. Instr.)		Log (FemSal Ten)		Log (FemSal Non-Ten)	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
URate	-0.136***	-0.099***	-0.083	-0.134	-0.046***	-0.028***	-0.020	-0.007
	(0.015)	(0.025)	(0.063)	(0.111)	(0.004)	(0.005)	(0.015)	(0.025)
URate L1	0.090***	0.066**	0.133**	0.322**	0.018***	0.008	0.003	-0.004
	(0.015)	(0.033)	(0.065)	(0.126)	(0.005)	(0.011)	(0.013)	(0.039)
URate L2	-0.167***	-0.083***	-0.112*	-0.227**	-0.072***	-0.033***	-0.038**	0.002
	(0.012)	(0.021)	(0.062)	(0.097)	(0.005)	(0.010)	(0.016)	(0.036)
Endow.		0.002***		0.001		-0.000		0.001
		(0.001)		(0.007)		(0.000)		(0.001)
Endow. L1		0.001**		-0.002		0.002***		-0.001
		(0.001)		(0.012)		(0.000)		(0.002)
Endow. L2		0.003***		0.013***		0.001***		0.002**
		(0.001)		(0.005)		(0.000)		(0.001)
Constant	6.155***	5.553***	2.097***	1.772***	11.225***	10.918***	3.538***	3.277***
	(0.091)	(0.126)	(0.485)	(0.667)	(0.039)	(0.039)	(0.097)	(0.156)
Observations	621	440	419	267	601	433	219	153
University FE	YES	YES	YES	YES	YES	YES	YES	YES
R-Sq Within	0.530	0.419	0.015	0.104	0.573	0.475	0.207	0.039
R-Sq Overall	0.150	0.133	0.013	0.000	0.400	0.423	0.158	0.088
R-Sq Between	0.002	0.073	0.132	0.000	0.097	0.347	0.151	0.030
Chi-Squared	249.510	561.456	4.344	23.496	804.651	497.683	24.618	49.117
Chi P-Value	0.000	0.000	0.227	0.001	0.000	0.000	0.000	0.000

Standard errors in parentheses
* p<0.1 ** p<0.05 *** p<0.01

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